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ANNUAL SUMMARY REPORT NO. 1

RESEARCH STUDY AND DEVELOPMENT OF 1 METRE-MIRROR FOR MOON TRACKING AND PHOTOGRAPHY

by

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The research reported in this document has been sponsored by, or in part by, the Office of Aerospace Research, United States Air Force, through its European Office.

PERSONNEL

The scientific personnel engaged in work and consultation towards the objectives of the contract during the period covered by this contract included

Professor Zdeněk Kopal, University of Manchester
Dr. James Ring, " " "

Dr. George M. Sisson, Grubb-Parsons, Newcastle
Mr. C. S. Manville, " " "

Dr. Jean Rosch, Observatoire du Pic-du-Midi
Dr. Audouin Dollfus, Observatoire de Meudon

Miss Ellen B. Finlay rendered secretarial assistance throughout all negotiations.

SCIENTIFIC OBJECTIVES

The principal task under contract AF 61(052)-400 in the first year of its operation has been to secure the optics for a long-focus telescope of aperture not less than 40 inches, to be erected at the Observatoire du Pic-du-Midi in the French Pyrenees, at an altitude of 9,373 feet, and used in the interest of lunar and planetary studies supported by the U.S. Air Force.

As the first step in this direction, an order for the 40-inch mirror was placed with Messrs. Grubb-Parsons Ltd. in Newcastle-upon-Tyne in England. Their final quotation, dated April 19th, 1960, called for the delivery of the following optical components:

(1) paraboloidal mirror of f/3 focal ratio, and aperture not less than 40 inches, the surface of which would approximate the true paraboloid within $\pm \lambda/20$ over its entire surface;

(2) hyperboloidal Cassegrain mirror of aperture 9 inches, giving a focal ratio of f/15 for the combination; and

(3) a second Cassegrain mirror of 5 inches aperture and f/30 focal ratio,

to be delivered within approximately twelve months; and the offer was accepted on April 29th of 1960.

Messrs. Grubb Parsons placed thereafter an order for the necessary block of glass at first with the Chance and Pilkington Optical Works at Birmingham; but owing to the delays caused by strikes the order was deflected to the Schott Glass Works in Mainz, Germany. The delivery of the glass blank, promised for November 1960, was delayed somewhat by

a fault in annealing of the disk which had to be re-annealed; and, as a result, it was not actually delivered at Newcastle till January 1961. When unpacked, the disk turned out to possess a diameter of 42 7/8 inch - almost three inches larger than anticipated - at no increase in cost.

Once in Newcastle, the optical work on the disk proceeded without interruption at top speed, and by April 1961 - by the end of the period covered by this first Annual Report - the optical surface of the mirror was almost within the limits of required tolerances. The acceptance tests of the finished products are expected to be held within 4-6 weeks after the end of the period covered by this report, and it is expected with confidence that they will live fully up to the desired performance.

In the meantime, the design of the mounting of the proposed telescope has been virtually completed by Dr. Jean Rösch and his associates at the Observatoire du Pic-du-Midi, and a contract for its erection (funded by the French Ministry of Education) placed with the French Army Arsenal at Tarbes. By the end of the period covered by this report, the mechanical work on the tube of the telescope as well as on its polar and declination axis was well advanced; some delay being encountered only in the work on the cell which should support the mirror.

As another contribution on our part to the joint effort, pursuant to clause A-1 of Part VI of Contract AF 61(052)-400, an order for a crystal-controlled oscillator to monitor the drive of the telescope was, on Dr. Rösch's request, placed with Messrs. Secasi at Bordeaux on August 8th, 1960, and confirmed by them on August 26th. By the end of the period covered by this report, this sensitive part of the equipment was likewise almost completed to full satisfaction, and its delivery directly to Pic-du-Midi is expected in the summer of 1961.

The design of the seeing-triggered film camera, to be used for lunar and planetary photography in connection with the new telescope has been worked out by Dr. Ring and Mr. Rackham in our laboratories in Manchester (assisted by Mr. A.M. Phale); but no construction has begun as yet - partly because of the shortage of adequate manpower, and partly because of current negotiations with A.C.I.C. as to the best type of output which could help their own work. It is, however, expected with confidence that a camera of requisite performance will be put into service before the completion of the new telescope, which is now expected to commence its duty in the service of lunar and planetary photography from Pic-du-Midi before the end of the calendar year of 1961.